Author - Industry Canada-Manufacturing and Processing Technologies Branch/Direction générale des technologies de fabrication et de transformation Publication Date - 1997-09-24

CHANGING MARKETS FOR OCEAN TECHNOLOGIES
INDUSTRIAL TECHNOLOGIES DIRECTORATE
JANUARY 1994

TABLE OF CONTENTS

EXECUTIVE SUMMARY
INTRODUCTION
DECLINING MARKETS
- Offshore Oil and Gas
- Defence
- Ocean Sscience

EMERGING MARKETS
- Exclusive Economic Zones
- Marine Environment
- Marine Diversification

CONCLUSIONS

EXECUTIVE SUMMARY

Canadian ocean technology companies are typically small, privately-owned, export oriented producers of technology intensive products and services with concentrations of expertise on the East and West Coasts.

Offshore oil and gas, defence and ocean science, the traditional markets for these companies, have been in transition for some period of time and demand in each has declined. New markets, such as the mapping of Exclusive Economic Zones (EEZs), and monitoring of the marine environment of pollutants have emerged.

Offshore oil and gas, the major economic driver for the industry from the mid-1970's to the mid-1980's, has suffered a steep decline domestically over a relatively short time. Internationally, the oil companies appear to be placing more emphasis on geological risk than on political uncertainty than in the past with the trend toward increased offshore spending.

Although the near to medium term picture for Canadian frontier development looks bleak, the longer term prospects appear more optimistic given the combination of the need to find new domestic reserves and such public policy concerns as security of supply and impact of imported oil on the deficit.

Defence budget cuts, and a shift toward cost effectiveness rather than technical performance, are causing defence contractors to restructure in the image of the commercial sector by competing on a price basis with shorter development cycles. Flexible production and diversification to civil markets are occurring.

International collaboration with focused research is likely to result from economic pressures; Canadian companies with leading edge technology but no government financial support are unlikely to be able to play a strong role.

Areas of prime interest for Canadian firms are Mines Countermeasures (MCM) and Anti-Submarine Warfare (ASW). There is some uncertainty as to where MCM and ASW will fit in future defence priorities.

Competition is expected to be fierce and non-tariff barriers could become more prevalent. Strategic alliances will be important for firms to maintain their market position.

Ocean science expenditures, through the contracting-out policy of the Departments of Fisheries and Oceans and National

Defence, although a main stay of the industry in the past, especially for applied RD, are declining through government restraint measures.

Industry must be prepared for a new working relationship with the marine institutes that have traditionally been a source of funding support. The type of support to industry that these agencies can be expected to offer in the future will be as a source of expertise, rather than as a source of funding. Exclusive Economic Zones, under the terms of the 1982 United Nations Convention on the Law of the Sea provide an opportunity for turn-key projects using ocean technology expertise. Claimant nations must meet conditions for the areas claimed including the maintenance of law and order, preservation of the environment, provision of navigational aids, search and rescue, etc.

A consortium approach offering a broad range of equipment and services or a turn-key approach are likely to be the most successful; Canadian companies will need to network and package their considerable expertise.

Marine environment concerns are resulting in a need for identification, monitoring and clean-up of marine pollutants. This market is regulation driven and offers considerable potential for Canadian firms.

Strategic alliances and consortia of the numerous small Canadian companies with leading edge technologies will be critical to their competitiveness in capturing these and other international market opportunities.

The next few years could be critical for a number of companies in this sector. If funds, used for contracting out, are reduced further it is possible that many firms will find it too difficult to maintain critical investments in product development and international marketing.

To meet the challenge firms must be willing to seriously pursue new business relationships that will help defray costs. The European experience with "flexible networks" is one alternative that the industry will be encouraged to review.

INTRODUCTION

The ocean industry sector is an integral part of the small "high-tech" business community in Canada. The companies in this sector are, for the most part small, privately-owned, export oriented producers of technology intensive products and services. On the east and west coasts of Canada they are recognized provincially as important contributors to local economies. Through changes in domestic and global priorities, the Canadian ocean industry's traditional markets of offshore oil and gas, defence and ocean science have been in a state of transition for some period of time. While the causes for the change may differ in each of these markets, the effect has been the same, demand has declined.

The first part of this paper addresses these three markets and attempts to identify the magnitude of the declines that have occurred and the impact of these declines on the ocean industry firms in Canada. The second part reviews the emergence of new markets that appear to hold potential for increased sales and growth for firms in this sector.

DECLINING MARKETS

OFFSHORE OIL GAS

Summary

A major market for Canada's ocean industry was the domestic operations of the offshore oil and gas sector. Expenditures, by the oil companies, on these operations have declined dramatically since the mid 1980's. There are a number of reasons that can be attributed to the decline; falling oil prices, an overall financial weakness in the oil sector, the phasing out of the federal government's Petroleum Incentive Program (PIP) grants and competition from other geographic areas that are seen by the industry as offering higher exploration potential than Canada. With these factors, along with the belief that the price of oil will remain within the US $18 - $20 bbl for sometime, it is unlikely that the oil and gas industry will increase the level of its activities in Canada's offshore areas in the next few years.

While the price of oil, geological risk and political uncertainties are major determinants affecting industry commitments to exploration and capital expenditure levels, they are not the only factors. National concerns such as security of supply and balance of payments can impact on public policy and thereby on industry decision making. For example, if Canada's current domestic oil production were to be imported rather than replaced, the estimated cost to the nation would be $11 billion annually. With the likelihood of Canada's traditional domestic sources of supply from the Western Canadian Basin (WCB) becoming depleted over the next ten years, these type of concerns will become increasingly important.

The frontier offshore regions still offer the best potential for replacing the depleted reserves of the WCB. Sizable oil reserves have already been discovered in these regions. The economics of these resources could be enhanced through technology uplifts. There is, therefore, room for cautious optimism based on national security supply needs, anticipated increases in population and

economic growth, that activity will resume in Canada's frontier offshore. The Canadian ocean industry should not, however, be looking to this market sector for any substantial improvement in the immediate or near (1-2 year) term.

Background

From the mid-1970's until the mid-1980's, offshore oil and gas expenditures were the prime economic driver for the ocean industry in Canada. The offshore oil industry, apart from the sourcing of traditional oil field equipment, (heaters, separators, tubing, drill bits, etc.) and services (mudlogging, wireline logging, drilling, cementing, etc.) caused and enhanced the development of some unique ocean-related equipment and systems. Manned and remotely operated vehicles (ROV's), one atmosphere subsea production systems, one atmosphere deep diving systems and arctic exploration and production systems, exemplified Canadian ocean related technological developments.

The oil industry's operations in Canada's offshore also led to an increase in resources required to monitor and regulate these activities. Regulatory requirements such as Environmental Impact Statements (EIS) and Project Development Plans generated additional business opportunities for ocean science and consulting engineering groups.

These firms supplied and utilized a broad range of sophisticated ocean-related sensor instrumentation (infra-red and laser-based remote sensors, conductivity, temperature and depth gauges (CTDs), salinometers, tide, wind, current and wave measuring devices, hydrophones and acoustic devices, etc.). These instruments were used in such service operations as hydrographic, oceanographic, geophysical, geotechnical, pipeline, ice and environmental monitoring surveys.

Since the mid-1980's there has been a steep decline in domestic offshore oil and gas operations. The following table provides an indication of the magnitude of this decline over a relatively short time frame, of the oil industry's operations in Canada's offshore.

Exploration Expenditures
(Millions $)

	1985	1990	1992
Beaufort Sea	789	35	7.8
Artic Islands	56	-	-
Hudson Bay	37	-	-
Newfoundland	657	36	0.8
Nova Scotia	481	4	-
Total	2020	75	8.6

Source: COGLA/EMR Annual Reviews - Frontier Lands

There are a number of reasons for the decline. Falling oil prices, weak natural gas prices, the overall financial weakness in the industry and the phasing out of the Petroleum Incentive Program (PIP) grants, that were provided under the federal government's National Energy Policy, each played a major part.

There are no indications that the current low levels of activity in Canada's offshore areas will increase in the near to medium term. This prognosis is substantiated by the findings of a report by Salomon Bros., concerning an annual survey this company undertakes of the oil and gas industry's planned worldwide exploration and production expenditures. The 1993 survey canvassed 260 companies worldwide including 104 in Canada. In the survey, each company was asked where it saw the greatest exploration potential internationally.

It will be noted from the following table that of seven geographical areas identified, Canada is ranked the lowest with a 4% level of interest. Of particular note too, is the lack of interest in Canada by the Canadian companies and the major oil companies. The reason for this appears to be the oil companies now placing more importance on geological risk than on political uncertainties as in the past.

Areas of Greatest Potential Internationally

AREAS	MAJORS	CANADIAN COMPANIES	INTERNATIONAL COMPANIES
Pacific/Far East	36%	50%	62%
Africa	36%	40%	38%
Commonwealth of Ind. States	27%	30%	27%

Mexico, Central and South America	18%	30%	27%
Europe	64%	40%	62%
Middle East	27%	0%	31%
Canada	0%	0%	4%

Source: Salomon Bros. Inc.

A summary of the industry's projected expenditures, based on an average oil price of US $20.40 bbl, is contained in the following table.

Summary of 1993 Planned Oil Gas
Exploration Production Expenditures
(Millions of US Dollars)

	Companies Surveyed	1992	1993	Year to Year % Change
United States	167	$14,442	$14,821	+2.6%
Canada	104	$3,841	$3,836	-0.1%
International	88	$33,885	$33,693	-0.6%
Worldwide	260	$52,168	$52,350	+0.3%

Source: Salomon Brothers Inc.

Other points of interest from the survey include:

- A substantial swing to natural gas exploration from oil is expected to begin in the United States in 1993.
- A decisive shift toward more offshore spending is planned. This trend is particularly true for the U.S. where more than twice as many companies plan to increase the percentage of their budgets devoted to offshore rather than onshore. (The Gulf of Mexico is the prime area.)
- Developments in seismic technology, followed by horizontal drilling, were the most frequently named technologies affecting oil companies.
- Overall, despite the bleak outlook for Canada, the oil patch is decidedly optimistic on the three to five year outlook for their business.

While oil prices are not expected to increase appreciably over the next few years, they are expected to remain stable. Price stability may be a prime cause for the optimism in the industry as it is so important in planning and establishing future expenditure levels. The industry's move to areas of low geological risk but high political uncertainty, as demonstrated by the Salomon Bros. survey, reflects a change in the conservative philosophy that has characterized this industry in the past.

Based on this new business outlook and the fact that past exploration activity on Canada's frontier areas has not lived up to expectations, the near to medium term picture for Canadian frontier developments looks bleak. In the longer term however, there is room for optimism, especially when other factors are injected into the decision making process. Assuming oil and gas continue to dominate Canada's energy needs for a few more decades, then new domestic reserves will need to be found.

It has been recognized for sometime that the oil reserves in the Western Canadian Basin are expected to run out early in the next decade if current levels of production are maintained. As the WCB accounts for most of the industry's current oil production, alternative domestic sources will be needed to replace these dwindling reserves.

Canada's frontier areas still offer the best prospects for new sources of supply. As can be seen in the following tables from a study sponsored by the Panel on Energy RD (PERD) entitled "A Research Planning Study for Canada's Frontier Oil Gas", the offshore regions represent the greatest potential for not only future domestic oil supplies, but for gas supplies as well.

Estimated Recoverable Reserves

Area	Liquid (billions/bbls)	Gas (Tcf)
Offshore BC	-	-
Yukon Territory	0.005	0.3
Central Southern NWT	0.305	0.5
Beaufort Sea/Mackenzie Delta	1.000	12.0
Artic Islands	0.455	17.0
Labrador	-	5.0
Grand Banks	1.5	4.0
Nova Scotia	0.135	5.0
Total	3.4	43.8

Source: PERD Planning Study for Canada's Frontier Oil Gas, December 1992.

Recoverable reserves are those that have been discovered and to some degree delineated. While these reserves are significant, (for example, the remaining oil reserves in the WCB are estimated at four billion bbls), they are, according to the study, less than the industry had been hoping for. The industry had also been expecting to locate super-sized fields of one billion bbls or more, but none of this magnitude have so far been found. Fields of this size would provide the reserves needed to make development commercially attractive.

Typical development and production costs in the frontier regions are such that high volume flow rates of a minimum 80,000 bbls/day with a sustained throughput for up to 25 years, are needed to justify investment. The Hibernia oil field, for example, is expected to produce 100,000 bbls/day for about 20 years.

Potential reserves are those that are based primarily on the results of seismic surveys and some wildcat drilling. As can be seen in the next table, the potential reserves in the frontier areas are also large.

Estimated Additional Potential Reserves

Area	Liquid (billions/bbls)	Gas (Tcf)
Offshore BC	1.0	15.0
Yukon Territory Central Southern NWT	0.5	4.0
Beaufort Sea/Mackenzie Delta	2.5	24.0
Artic Islands	0.5	15.0
Labrador	-	7.0
Grand Banks	3.0	5.0
Nova Scotia	0.2	8.0
Hudson Bay/Martimes	0.5	1.5
Total	8.2	79.5

Source: PERD Planning Study for Canada's Frontier Oil Gas, December 1992

The combined recoverable and potential reserves on Frontier lands are significant. The PERD Study, using current energy prices, estimated the value of these combined reserves to be in the order of $100 billion to $300 billion. Using a base price of US $20 bbl, the study concluded that there were several economically viable development scenarios that could be exploited based on reserves already found. Reservoirs of 350 million bbls appear to be the threshold reserves needed for Beaufort Sea projects and 200 million bbls for project developments on the East Coast. The study also concluded that the return on investment from such developments could be enhanced appreciably through an RD approach focused on cost reduction.

DEFENCE

Summary

Major changes in the defence contracting sector globally are occurring in response to budget cutbacks. The uncertainty these cutbacks are causing in terms of future funding levels and defence priorities is expected to be the norm for some period of time. As a reflection of the influence of current tight fiscal policies on defence spending, cost effectiveness will be, for the foreseeable future, an important criterion in the awarding of contracts. While the industry is going through a period of transition to adapt to these changes, it is likely, at least for the next few years, that there will be too many suppliers chasing too few contracts. In these types of market conditions, exacerbated by the current period of economic downturn and the fact that defence contracts involve public funds, it is possible that non-tariff barriers could become more prevalent.

There are between 30 to 40 companies in Canada who provide niche capabilities to the ocean defence market. Mines countermeasures (MCM) and anti-submarine warfare (ASW) defence activities are important to these firms; however, future expenditures on these type of activities and their priority in the defence market as a whole is unclear. Some of these companies have established strategic business linkages with larger defence contractors in the US and Europe, which could provide some protection from non-tariff barriers that may appear through the current downturn. As a further reflection of the changing times, defence contractors may, in the future, be expected to turn more of their research to meet societal concerns. The United States Office of Naval Research support for marine research emphasizing environmental quality could be the precursor of a refocussing of defence research toward a dual objective of defence and spin-off societal benefits. The UK's Pathfinder Initiative is another example where defence and commercial objectives are being encouraged to maximise benefits. The Department of National Defence's Defence Industrial Research Program, also favours dual technology applications.

Background

The marine defence market is viewed by many firms as having characteristics that are different than those of other markets. Regardless of their size, companies selling to this market have observed that stringent requirements to meet military specifications, extremely tight quality control, on time and reliable delivery and security needs are such that they must dedicate resources to this market or not pursue it at all. These market conditions however, are changing and are dealt with further on.

From the late 1980'S, increased detente with the former Soviet Union and Eastern European Bloc and the subsequent dismantling of these communist states, has led to declines in defence spending.

Examples such as France cutting its 1993 defence budget by $1 billion to help cover costs in its social security system, Japan's plan to cut defence spending by $4.70 billion over the next three years and plans by the Americans to reduce the US defence budget by $127 billion over the next five years, are indications of the changes occurring in this sector. (*)

Due to these factors there is some uncertainty as to where defence priorities and future funding levels are headed. This uncertainty is expected to be the norm for some period of time. The perspectives of future public policies and trends in the defence industry do, however, tend to emphasize cost-effective measures or ways to save money. An example of these types of measures would be an increase in the use of "off the shelf" equipment, i.e. procuring equipment that has been developed for another customer, e.g. for the civilian market. Another example would be to keep major equipment longer through updates.

From a private sector perspective, the increased emphasis on cost effectiveness by governments is creating the view that costs are now considered as important as technical performance. As a consequence, the defence industry in the US is making efforts to restructure itself in the image of the commercial sector, i.e. competing on a price basis and shorter development cycles. The larger companies are also anticipating that future production runs will be smaller or even customized.

As a reflection of these changing priorities, firms are investing more in process technology such as "flexible production" lines. This type of manufacturing process uses software, flexible machines and agile teams that allow shifts from one type of production to another without major re-tooling and costly downtime. Defence market oriented companies are also expected to exploit their technical capabilities in non-defence markets. Canadian Marconi whose sales have declined through defence cuts, is already committed to market diversification. The company is pursuing applications for its navigation and radar capabilities in such fields as fisheries surveillance, drug interdiction and coastal monitoring for environmental problems. Hermes Electronics, a major supplier of sonorbuoys to the US Navy, is seeking also new markets and ways to diversify its operations so it is less dependent on the defence sector.

(*) Source: Aviation Week Space Technology, January, 4 March, 15, 1993.

In general, however, it is argued that the larger ocean defence contractor is unlikely to find the ocean science market attractive. The characteristics of this market, such as low sales volumes and high performance requirements, are not likely to appeal to companies used to dealing with the large volume needs of the military. There are, however, potential benefits to ocean industry firms from the down-sizing that is occurring in the defence sector. Down-sizing is expected to create a large pool of skilled and professional people who will be looking for new careers over the next few years. A report by the US based Office of Technology Assessment on the effects of east/west detente estimated that by the year 2001 as many as 83,000 engineering positions in the defence industry will be eliminated.

Economic pressures are also expected to encourage international collaboration from which more focused research will be

delivered. In this connection, the Independent European Programme Group (IEPG), consisting of 13 European nations, which was formed in 1976 with the aim of promoting European collaboration in defence equipment matters, including research, development and production, is expected to become more prominent.

In the UK, the Defence Research Agency (DRA), in the latter part of 1992, launched a program called the Pathfinder Initiative. The aim of this program is to improve the value of the UK's Ministry of Defence (MOD) Research Program by collaborating with, and strengthening its links to the private sector. To meet this objective, proposals from industry have been invited that align with a company's own existing plans and DRA's broad objectives. Over 600 proposals have been submitted since November 1992 when Pathfinder was announced.

In the USA there are indications that national defence oriented research funding is being refocused to societal needs, such as ways of improving quality of life. An example is the Office of Naval Research which earlier this year sought proposals for basic research in support of marine environmental quality.

There are two prime areas of interest in the marine defence sector for Canadian ocean technology companies, mines countermeasures (MCM) and anti-submarine warfare (ASW). There are some 30 or more companies in Canada active in these two military markets. Canadian strengths in acoustics and other subsea technologies such as remotely operated vehicles (ROVs), manipulators, towed body, towed array systems and sonorbuoys are particularly relevant to these markets. Acoustics, in the form of sonar systems, represent the main field of technology used in the detection of both mines and submarines. Remotely operated vehicles (ROVs) and autonomous underwater vehicles (AUVs) are being used as platforms to carry rotary and side-scan sonar systems for application in water depths of over 100 meters.

There are mixed views, however, on where future MCM and ASW requirements will fit in defence priorities. For small nations and even terrorist groups, mines are a cheap, cost-effective weapon for waging war at sea; as a result MCM is seen by some as an important growth area. To support this view there are significant resources being applied in Europe and in the US toward the development of AUVs that would augment a ship's ability to fight in mined waters in shallow coastal areas. The opposing view is that while mines are a threat, there have been few mine incidents that have created a serious problem since World War II; consequently MCM will be a low priority for the military. This view may be particularly appropriate in Canada judging by the change in operational requirements for the 12 vessels planned under Canada's Maritime Coastal Defence Vessel (MCDV) Program. The original intent for these vessels was mine countermeasures. The vessels will now, however, be designed for multi-role operations including fisheries and coastal surveillance and drug interdiction.

The overall ASW market in the US is currently estimated at $6.1 billion and this is expected to drop to just over $5.0 billion by 1997. The following table provides just three of fourteen sub-sectors that were identified in a study by the US firm, Frost Sullivan, as constituting this market. The table illustrates the decline in ASW expenditures expected in the next few years.

Antisubmarine Warfare Market
(Millions $)

Application	1993	1994	1995	1996	1997
Sonar Program	679.2	594.0	602.0	574.0	535.0
Signal Processing	302.9	243.0	229.0	211.0	178.0
Surveillance Systems	650.5	420.0	402.0	364.0	349.0

Source: Frost Sullivan Report, "The U.S. Market for Antisubmarine Warfare", 1993.

The Frost and Sullivan study also indicates that the US Navy is shifting its ASW efforts away from the production of weapons systems and toward advanced RD, and is reorienting its existing ASW systems to meet the demands of regional conflicts in shallow water. The potential application of AUVs in shallow water ASW operations as well as MCM activities, could make AUV enabling technologies an area where the Navy will place some of its RD emphasis.

OCEAN SCIENCE

Summary

The consensus in the ocean industry and among the marine science community in general is that, over the past five years, government funds available for contracting-out ocean science RD with the private sector have been progressively reduced. The termination of the Unsolicited Proposal Program (UPP) in particular, has been seen as a severe loss by many small ocean firms. There are no readily available data that would indicate to what degree new funding initiatives such as the Green Plan and the Atlantic Fisheries Adjustment Program have helped in replacing the UPP. There are, however, indications that overall, funds are being reduced, since over the last three years DFO's Science budget has dropped on average by $10 million.

With the government's current tight fiscal restraint policy, it is unlikely that there will be any increase in departmental budgets

in the foreseeable future; rather, further declines can be anticipated. Programs that provide financial support to the private sector are one area where the government is expected to make cuts in future expenditures.

In general the small ocean technology firms in Canada have benefited from close working relations with the science institutes. Aside from the financial support, these institutes provide other significant benefits such as scientific advice, exposure to techniques and ideas and access to testing equipment, laboratories and library sources. Through technology transfer they have been instrumental in the formation of new companies and the enhancement of existing ones. These types of non-fiscal support services are likely to become a major part of the support activities of these institutes in the future. Governments at all levels are stressing the need to make effective use of existing resources. In this connection, the role of the science community within government can be expected to be a more active one in supporting industry, by offering themselves as a source of expertise, rather than as a possible source of funding.

One of the priorities of the federal government's ocean strategy still is to develop "prosperous, dynamic ocean industries" with "world class expertise and capabilities in ocean-related science, technology and engineering". (*) Government laboratories and institutions, while effective in taking money and converting it into scientific knowledge, as they have been expected to, could in the future be asked to go the next step and think in terms of converting the knowledge into money.

(*) Source: FO 1987, Oceans Policy for Canada

Background

The Canadian federal government's expenditures, in support of ocean science activities, are undertaken primarily through marine research institutes such as those of Fisheries and Oceans, in particular the coastal establishments, the Bedford Institute of Oceanography and the Institute of Ocean Science, and those of National Defence, i.e. Defence Research Establishment Pacific (DREP) and Defence Research Establishment Atlantic (DREA). The fulfilment of the mandates of these institutes in such areas as environmental protection, mapping, charting, marine defence and research has, through such measures as contracting-out, technology transfer and the purchase of products and services, provided an important base of support to the industry in Canada.

Contracting-out has also been particularly important in support of applied research, as it provided a critical base of RD funding support for a large number of ocean industry firms since it was introduced as part of the government's "Make-or-Buy" policy of the 1970's. The main sources of funds for contracting-out purposes were the A-Based funds of the Fisheries and Oceans (FO) Science Sector and the Unsolicited Proposal Program (UPP) that was administered by Supply and Services. There is little definitive information available on the level of annual A-Based funding expenditures by FO for contracting-out. This type of data has been made more difficult to gather over the last few years when B- Based funding, from such programs as the Green Plan and the Atlantic Fisheries Adjustment Program, has been included in DFO's science budget. The importance of FO's expenditures through the contracting out process was highlighted in a 1990 study that reviewed the economic impact of the west coast operations of the Institute of Ocean Sciences (IOS), on the private sector. The study gives an indication of how interactive and supportive FO was with the small ocean industry firms during the 1980's. For example, from 1984 through to 1989, IOS expended between $3 - $4 million annually on contracting-out. These annual expenditures over this period resulted in the award of approximately 750 contracts to over 180 companies in the private sector.

As can be seen from the following table, however, there was a decreasing trend in both the amount of funding support provided annually by the Institute and in the average value of each contract awarded, between the periods 1984-1986 and 1987-1988. By way of comparison, the IOS contracting-out budget for 1989 was about $4 million.

ISO Contracting Budget

Period	# of contracts	Total Value	Average Value
1984-86	347	$13.7M	$39.5M
1987-88	401	$6.5M	$16.2M

Source: ISTC sponsored study, "Institute of Ocean Sciences, Impact Review", 1990, Cabot Management Ltd.

As mentioned earlier, it is difficult to obtain statistics that separate A-Base funding from B-Based funding allocated to marine science activities by Fisheries Oceans. Consequently, it is difficult to substantiate what many companies and scientists believe to be the case, namely, that government funding has declined significantly in real terms, over the past five years or more.

The bar chart below is based on data taken from the government's Main Estimates. The chart indicates only a slight decline over the period from 1985 to 1989, when budgets were derived primarily from A-Based funds.

B-Based funds from the Green Plan and the Atlantic Fisheries Adjustment Program that began to flow to FO in fiscal year 1989/90 significantly increased the overall science budget in 1990/91 and again in 1992 as the table on the next page shows.

A more detailed breakdown of DFO Science Expenditures by majoractivity is provided in the table below. The amounts are in spent dollars as the CP Index has not been factored in.

DFO Science Expendatures

Activity	1989/90	1990/91	1991/92	1992/93	1993/94
Biological	110.5	125.6	126.9	116.4	116.4
Physical Chemical	46.7	57.2	54.5	54.3	51.9
Hydrography	40.5	47.7	40.7	38.9	36.6
Total	*197.7	*230.5	*222.1	**209.6	***204.9

(* ACTUAL ** FORECAST *** ESTIMATE)

Source: Cdn Government's Main Estimates.

Fiscal year 1990/91, when there was a significant infusion of B-Based funding, was the high point in DFO's Science Sector's budget for the last eight years or since the Science Group was established. It will be noted that funds have declined by almost $10 million a year since 1990/91 and are expected to be reduced again as part of the current cost cutting exercise. Perhaps more noteworthy is the fact that of the 1992/93 non-salary operating budget for the Physical Sciences department at IOS, 40% came from the Office of Naval Research in the USA, while only 30% was funded by A-Base OM funds.

There is also a paucity of information on the amounts that the Department of National Defence (DND) has expended annually on contracting-out RD with the private sector. Unofficially, the Defence Research Establishment Atlantic (DREA) has expended about $10 million annually for the last five years on contracting-out. Based on constant dollars, the annual budget for this activity has been decreasing in real terms by the rate of inflation. DREA's sister organization on the west coast, Defence Research Establishment Pacific (DREP) because it is smaller, can be expected to have allocated about one-third less, or about $6 to $7 million, for contracting-out. It is expected that these budgets will be decreased in the next fiscal year as part of the government's fiscal restraint measures.

As a component of the above budgets DND allocated certain amounts to "undersea warfare". The following table provides an indication of these amounts for the last three years.

DND Expendatures

1991/92	1992/93	1993/94
*6,941	**6,360	**6,589

(* Actual ** Estimates)

Source: DND (CRAD)

DND's overall budget for RD for the Navy, undertaken in-house and through contracting-out is estimated to be $55 million for this fiscal year (1993/94). As a comparison, the budget for the same purpose in fiscal year 1987/88 was $59 million. Using these two examples and not accounting for inflation, DND funding has decreased by about 7% since 1987. (*)

During the 1980's ocean industry companies were also highly successful in securing funds from the Unsolicited Proposal Program (UPP). This program, which was administered by Supply and Services, began in the early 1970's with a budget of $3 million and at the time of its conclusion in 1989, had an annual budget of approximately $23 million. Under the UPP, companies could obtain 100% percent of the cost for projects. It has been estimated that on average as much as 25% to 30% of the UP Program's funds were captured annually during the 1980's by ocean industry firms. An indication of the funds that were made available to the oceans sector during the 1980's is contained in the table below.

Source: Supply Services

Between FO's A-Base funding and funds from the UP Program, over $10 million annually was provided to ocean sector firms in support of RD contracts during most of the 1980's.

(*) Source: DND. (Chief Research and Development)

EMERGING MARKETS

EXCLUSIVE ECONOMIC ZONES

Background

A common characteristic of companies in the ocean industry in Canada and internationally is the fact that most are "niche" marketers. There are valid reasons for this, one being the fact that there are few market opportunities that require a team approach or offer turn-key type projects. The exception could be the needs of countries who have laid claim to their offshore regions as Exclusive Economic Zones (EEZs) under the 1982, United Nations Convention on the Law of the Sea (UNCLOS). The total area of EEZs that could be claimed under UNCLOS 1982, is estimated to represent about 40 percent of the area of the world's oceans. In claiming these EEZs, claimant nations are, however, obligated to meet certain conditions and responsibilities imposed by the UN for the area claimed, which include ensuring the maintenance of law and order, the preservation of the environment, the provision of navigation aids, search and rescue operations, etc. These obligations can provide new business opportunities as developing countries will likely need to seek from abroad the specialized systems, equipment, materials and services required to meet these new national responsibilities.

Other countries are already preparing strategies for exploiting the opportunities these EEZs will provide. The UK government considers the potential markets arising from newly established EEZs, as "one of the most significant export opportunities to emerge in recent years". To support British industry's efforts to enter these markets, the UK government has helped sponsor a catalogue of British capabilities that will be promoted internationally, among authorities and agencies responsible for the administration of EEZs.

Many of the nations claiming EEZs will be small island states with limited internal resources or experience to solicit and manage these diverse needs. In this connection, a consortium approach that can offer a broad range of equipment and services or a turn-key proposal will likely be more successful than individual approaches that offer niche market applications. As this is an emerging market, it is difficult to predict how quickly it will develop. It will likely be driven in part, however, by UN imposed time frames in which countries will be required to acquire the data needed to define their national boundaries.

Obviously some countries will want to move more quickly than others. It is likely that some of the smaller nations, with limited land-based resources, will wish to delineate their offshore areas and establish early, their potential for exploitation. These nations can be expected to seek the financial support of such institutions as the World Bank and other international funding agencies. Aid packages may also be an important means of access to these markets and in this regard the role of government would be important.

MARINE ENVIRONMENT

Background

Concern over the environment is generating a need for equipment and services that address such requirements as the monitoring, identification and clean-up of marine pollutants. These requirements, which are, in many instances, regulatory driven, are expected to result in the marine environment market experiencing a strong growth over this decade and even into the next century. As a reflection of the growing interest in this field, two biennial European Conferences and Trade Exhibitions will be held this year. Environment North Seas (ENS'93) which was first held in 1991, took place in Stavanger, Norway between August 24 to 27, 1993. This event was North Sea oriented but also addressed the Arctic Regions and the Baltic Region.

Clean Seas '93 which was also launched in 1991, took place in Malta in November 1993. The theme for this conference centered on the management of the water system of the coastal zone using monitoring as a tool. This event attracts interest from southern Europe and North Africa, government and private sector representatives from the Mediterranean region, including such countries as Turkey, Tunisia, the Gulf States, Egypt, Cyprus, Syria, Albania and Morocco attended along with World Bank officials. Clean Seas venue would appear to be tailor made for companies interested in expanding their sales into this market area, however, not more than three to four Canadian companies attended the event this year.

A component of the marine environment market is coastal monitoring. Maintaining a clean and healthy coastal sea with clean beaches is a high priority for many countries. In meeting this priority, reliable oceanographic "real time" data are needed. The types of technology requirements that will be used in this market are: modelling, consultant engineering, water quality instrumentation and sensors, e.g. temperature, conductivity, depth (CTDs), fluometers (Chla), current profiling and laser and infra-red based remote sensing for the identification and measurement of discharges of pollutants.

In Europe, as a consequence of European Economic Community (EEC) Directives, and the implementation of the polluter-pay principle, every coastal outfall in the Member States could require on-line monitoring instrumentation. It has been estimated that there are approximately 100,000 such outfalls. Assuming a conservative price-tag of $20,000 for an instrumentation package, this would suggest a potential market of $2 billion. (*)

In the UK there are two authorities that have been set up with statutory duties and responsibilities relating to the environmental quality of controlled waters which include estuaries and the sea to a distance of three miles from shore. In England and Wales the responsible agency is the National Rivers Authority (NRA) and in Scotland it is the River Purification Boards (RPBs). In 1993, the NRA implemented a Coastal Baseline Monitoring Program which involved extensive sampling for a number of parameters for the building of a map of water quality around the coast. (**) The initial survey work involved extensive use of remote sensing that was undertaken by a Canadian company, Borstad Associates, using the Compact Airborne Spectrographic Imager (CASI) developed by ITRES Research of Calgary, Alberta. To ground truth the remotely

sensed data gathered by Borstad, the NRA used a towed body, instrumented with a multi-parameter monitoring system which measured conductivity, temperature, depth and fluorescence and, with additional sensors for dissolved oxygen, pH, chlorophyll and transmission. It has been estimated that the market turnover for instrumentation, control and automation technology in the water industry in the UK is in the order of $28 million to $35 million with an annual growth rate of 4 percent to 7 percent. The European market is estimated to be about $150 million.

Other statistical data contained in the previously mentioned study, "Europe 1992 and Canada's Ocean industry", are worth noting as they give an idea of the magnitude of the pollution problem in Europe and the potential costs/market opportunities involved. For example: it is estimated that it will take $16 billion to clean-up the pollution in the Mediterranean Sea; Italy lost an estimated $2.6 billion in tourist revenues in 1990 due to pollutant and algae

(*) Source: Study, "Europe 1992 and Canada's Ocean Industry" sponsored by External Affairs International Trade Canada. (**) Source: January/February 1993 issue of Underwater Systems Design.

build-up in the Adriatic Sea; to combat this problem and other air and waste pollution, Italy will need to spend $60 billion by 2000; the UK market for marine environmental protection including oil pollution clean-up is estimated to be $600 million annually; in order to achieve 100 percent compliance with an E.E.C. Directive on the Quality of Bathing Beaches, the U.K. would need to invest an estimated $2.5 billion.

The demand for marine environmental equipment and services in Europe is substantial and growing. It has been enhanced significantly by regulatory requirements that reflect an increasing concern for the global environment. The market represents new business opportunities for Canadian companies, particularly in countries where there is little resident capability. Greece, Spain and Portugal could be countries who will need to rely, initially, on imported products, services and technology to meet market needs. These countries have, for the most part, been ignored by Canadian firms who have concentrated on the more affluent E.C. markets such as the U.K., Germany, Holland, France and the Scandinavian countries.

MARKET DIVERSIFICATION

Background

The strengths of the companies in this sector lie in their technical capability and capacity to develop innovative applications to problems requiring technical solutions. With the decline in their traditional markets, many ocean companies are beginning to seek wider market applications for their technologies so as to escape the feast or famine situation that has prevailed in the ocean sector for the past few years. For example, some of the telerobotic systems and technologies developed for the subsea needs of the offshore oil and gas industry, have numerous applications in the field of advanced manufacturing and as solutions to the in-situ operational needs of the resource sectors. Telerobotic manipulator systems developed for ocean needs are now being used in such sectors as forestry, nuclear utilities, medical devices and the space program.

An area where some of the subsea telerobotic technologies could provide significant productivity benefits is underground mining. Because 40-50 percent of an underground miner's work shift is spent getting to and from the work site, mining companies believe that mine productivity could be improved 50-60 percent by using equipment that can be telerobotically controlled from the surface. Electronic packages for remote operation of vehicles for the mining and forestry industries, have an estimated annual value of $40 million. Navigation and positioning systems are now being used in open pit mining and could find use in agricultural operations such as plowing and spraying.

While the mining and forestry sectors, as noted earlier, are seeking technology solutions to improve safety and productivity to in-situ operations, "getting a foot in the door" to these opportunities, may be viewed as being too difficult by many of the small ocean firms that have limited internal resources. One avenue of approach for these firms could be to seek a working relationship with a mining or forestry agency such as the Forest Engineering Research Institute of Canada (FERIC), the Forest Industry Technology (FORINTEK) and the Mining Industry Technology Council of Canada (MITEC). These agencies can help provide exposure to techniques and ideas and assist in the diffusion of technology. The relationships with these groups could be similar to the working relationships that many companies have developed with the marine science institutes.

CONCLUSIONS

The small ocean industry firms in Canada have, for the most part, managed to keep their operations solvent through some very difficult times over the last few years. The depressed conditions in their traditional markets for offshore oil and gas, defence and ocean science, are not expected to improve in the near term. Indeed, the next few years could be equally, or more challenging as the defence and ocean science sectors are expected to be among the areas that will experience further budget cuts as part of the government's plans to reduce its expenditures.

Aside from their difficulties in the marketplace, there is also a perception among the firms in the sector that their industry has little or no profile within the federal government. The basis for this concern arises from the fact that there has been no program or initiative to demonstrate support and commitment by the government to its Oceans Strategy that was enunciated in 1987. Recently, however, the National Advisory Board on Science and Technology (NABST) established a committee to investigate and report on the science and technology issues as they relate to the management of our ocean resources and our coastal areas.

In the coastal provinces the industry's contribution to the local economy is recognised. In British Columbia, the industry has been the focus of a major study that has resulted in a "Strategic Framework" proposal for the sector. The study was managed by the B.C. Science Council with significant input from the private sector. In Nova Scotia, the sector is currently under review by the Council on Applied Science and Technology (CAST) and in Newfoundland a similar, broad based, strategic review of the industry is in the formulative stages.

The next few years could be crucial for a number of companies in this sector. If the government's current level of support to industry is reduced, as is expected, it is possible that many of the small firms in this industry will find it too difficult to maintain the resources needed to meet product development and marketing activities. To meet the challenge firms must be willing to enter into collaborative ventures that would help defray costs and expand opportunities. The provincial initiatives mentioned above are expected to help promote more effective working relationships among the industry's stakeholders in the private, academic and government sectors. An effective networking approach, along the lines of the "flexible network" concept, would help position the industry to pursue opportunities in those new markets emerging from the creation of EEZs and the regulatory regimes being implemented globally to address environmental concerns.

[TO THE TOP]

Help What's New Sitemap Feedback About Us
Français Top of Page

Canada
http://strategis.ic.gc.ca

UPP Funding

FISCAL YEAR	# OF CONTRACTS	TOTAL VALUE
1983/84	42	$4.6M
1984/85	38	$6.1M
1985/86	48	$7.0M
1986/87	32	$5.7M
1987/88	35	$5.7M
1988/89	32	$9.4M